SEQUENCE LISTING

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        <110>  Vanderbilt University
               Balser, Jeffrey R.
  5            George, Alfred L.
               Roden, Dan M.


        <120>  HUMAN KCR1 REGULATION OF HERG POTASSIUM CHANNEL BLOCK

 10     <130>  1242-49

        <150>  60/244,340
        <151>  2000-10-30

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        <170>  PatentIn version 3.1


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        ttt tta gtg tcc tgc ctc ctc ttc tcc gcc ttc agc cgg gcg ctg cga      96
        Phe Leu Val Ser Cys Leu Leu Phe Ser Ala Phe Ser Arg Ala Leu Arg
                        20                  25                  30

 45     gag ccc tac atg gac gag atc ttc cac ctg cct cag gcg cag cgc tac     144
        Glu Pro Tyr Met Asp Glu Ile Phe His Leu Pro Gln Ala Gln Arg Tyr
                        35                  40                  45

        tgt gag ggc cat ttc tcc ctt tcc cag tgg gat ccc atg att act aca     192
 50     Cys Glu Gly His Phe Ser Leu Ser Gln Trp Asp Pro Met Ile Thr Thr
                50                  55                  60

        tta cct ggc ttg tac ctg gtg tca gtt gga gtg gtc aaa cct gcc att     240
        Leu Pro Gly Leu Tyr Leu Val Ser Val Gly Val Val Lys Pro Ala Ile
 55     65                  70                  75                  80
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          Trp Ile Phe Gly Trp Ser Glu His Val Val Cys Ser Ile Gly Met Leu
                           85                  90                  95

    5     aga ttt gtt aat ctt ctc ttc agt gtt ggc aac ttc tat tta cta tat          336
          Arg Phe Val Asn Leu Leu Phe Ser Val Gly Asn Phe Tyr Leu Leu Tyr
                           100                 105                 110

          ttg ctt ttc cac aag gta caa ccc aga aac aag gct gcc tca agt atc          384
    10    Leu Leu Phe His Lys Val Gln Pro Arg Asn Lys Ala Ala Ser Ser Ile
                           115                 120                 125

          cag aga gtc ttg tca aca tta aca cta gca gta ttt cca aca ctt tat          432
          Gln Arg Val Leu Ser Thr Leu Thr Leu Ala Val Phe Pro Thr Leu Tyr
    15                 130                 135                 140

          ttt ttt aac ttc ctt tat tat aca gaa gca gga tct atg ttt ttt act          480
          Phe Phe Asn Phe Leu Tyr Tyr Thr Glu Ala Gly Ser Met Phe Phe Thr
          145                 150                 155                 160
    20
          ctt ttt gca tat ttg atg tgt ctt tat gga aat cat aaa act tca gcc          528
          Leu Phe Ala Tyr Leu Met Cys Leu Tyr Gly Asn His Lys Thr Ser Ala
                           165                 170                 175

    25    ttc ctt gga ttt tgt ggc ttc atg ttt cgg caa aca aat atc atc tgg          576
          Phe Leu Gly Phe Cys Gly Phe Met Phe Arg Gln Thr Asn Ile Ile Trp
                           180                 185                 190

          gct gtc ttc tgt gca ggg aat gtc att gca caa aag tta act gag gct          624
    30    Ala Val Phe Cys Ala Gly Asn Val Ile Ala Gln Lys Leu Thr Glu Ala
                           195                 200                 205

          tgg aaa act gag cta caa aag aag gaa gac aga ctt cca cct att aaa          672
          Trp Lys Thr Glu Leu Gln Lys Lys Glu Asp Arg Leu Pro Pro Ile Lys
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          gga cca ttt gca gaa ttc aga aaa att ctt cag ttt ctt ttg gct tat          720
          Gly Pro Phe Ala Glu Phe Arg Lys Ile Leu Gln Phe Leu Leu Ala Tyr
          225                 230                 235                 240
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          tcc atg tcc ttt aaa aac ttg agt atg ctt ttc tgt ttg act tgg ccc          768
          Ser Met Ser Phe Lys Asn Leu Ser Met Leu Phe Cys Leu Thr Trp Pro
                           245                 250                 255

    45    tac atc ctt ctg gga ttt ctg ttt tgt gct ttt gta gta gtt aat ggt          816
          Tyr Ile Leu Leu Gly Phe Leu Phe Cys Ala Phe Val Val Val Asn Gly
                           260                 265                 270

          gga att gtt att ggc gat cgg agt agt cat gaa gcc tgt ctt cat ttt          864
    50    Gly Ile Val Ile Gly Asp Arg Ser Ser His Glu Ala Cys Leu His Phe
                           275                 280                 285

          cct caa cta ttc tac ttt ttt tca ttt act ctc ttt ttt tct ttt cct          912
          Pro Gln Leu Phe Tyr Phe Phe Ser Phe Thr Leu Phe Phe Ser Phe Pro
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His Leu Leu Ser Pro Ser Lys Ile Lys Thr Phe Leu Ser Leu Val Trp
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aaa cat gga att ctg ttt ttg gtg gtt acc tta gtc tct gtg ttt tta       1008
Lys His Gly Ile Leu Phe Leu Val Val Thr Leu Val Ser Val Phe Leu
                    325             330                 335

gtt tgg aaa ttc act tat gct cat aaa tac ttg cta gca gac aat aga       1056
Val Trp Lys Phe Thr Tyr Ala His Lys Tyr Leu Leu Ala Asp Asn Arg
            340             345                 350

cat tat act ttc tat gtg tgg aaa aga gtt ttt caa aga tat gca att       1104
His Tyr Thr Phe Tyr Val Trp Lys Arg Val Phe Gln Arg Tyr Ala Ile
            355             360                 365

ctg aaa tat ttg tta gtt cca gcc tat ata ttt gct ggt tgg agt ata       1152
Leu Lys Tyr Leu Leu Val Pro Ala Tyr Ile Phe Ala Gly Trp Ser Ile
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gct gac tca ttg aaa tca aag cca att ttt tgg aat tta atg ttt ttc       1200
Ala Asp Ser Leu Lys Ser Lys Pro Ile Phe Trp Asn Leu Met Phe Phe
385                 390             395                 400

ata tgc ttg ttc att gtt ata gtt cct cag aaa ctg ctg gaa ttt cgt       1248
Ile Cys Leu Phe Ile Val Ile Val Pro Gln Lys Leu Leu Glu Phe Arg
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tac ttc att tta cct tat gtc att tat agg ctt aac ata act ctg cct       1296
Tyr Phe Ile Leu Pro Tyr Val Ile Tyr Arg Leu Asn Ile Thr Leu Pro
                420             425             430

ccc aca tcc aga ctt gtt tgt gaa ctg agt tgc tat gca att gtt aat       1344
Pro Thr Ser Arg Leu Val Cys Glu Leu Ser Cys Tyr Ala Ile Val Asn
            435             440             445

ttc ata act ttt tac atc ttt ctg aac aag act ttt cag tgg cca aat       1392
Phe Ile Thr Phe Tyr Ile Phe Leu Asn Lys Thr Phe Gln Trp Pro Asn
            450             455             460

agt cag gac att caa agg ttt atg tgg taa tatcagtgat attttgaact         1442
Ser Gln Asp Ile Gln Arg Phe Met Trp
465                 470

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tggaatttct tttaggtgca gtggtggtct tcaaattaca ttagtttttt taatatatat    1562

tttaaacata tgtaagaaat taagtggcaa agaactggga aagcttaaga cctgcttcaa    1622

angcctgaat aatgggaaaa taaanwngtt tncagatatc tcatatcgct cnnnknatgn    1682

tggcccytmn caangcttgg gaatgkttnn wntgnataag ttnattaaan ctgggnntgc    1742

tnnmwatnac ttnnnkncca n̈ccwnnnwac natgnnntan nnantattta caaaggtcag    1802

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                  20                  25                  30

 20   Glu Pro Tyr Met Asp Glu Ile Phe His Leu Pro Gln Ala Gln Arg Tyr
                  35                  40                  45

      Cys Glu Gly His Phe Ser Leu Ser Gln Trp Asp Pro Met Ile Thr Thr
          50                  55                  60

 25   Leu Pro Gly Leu Tyr Leu Val Ser Val Gly Val Val Lys Pro Ala Ile
      65                  70                  75                  80

 30   Trp Ile Phe Gly Trp Ser Glu His Val Val Cys Ser Ile Gly Met Leu
                      85                  90                  95

      Arg Phe Val Asn Leu Leu Phe Ser Val Gly Asn Phe Tyr Leu Leu Tyr
                  100                 105                 110

 35   Leu Leu Phe His Lys Val Gln Pro Arg Asn Lys Ala Ala Ser Ser Ile
              115                 120                 125

      Gln Arg Val Leu Ser Thr Leu Thr Leu Ala Val Phe Pro Thr Leu Tyr
          130                 135                 140

 40   Phe Phe Asn Phe Leu Tyr Tyr Thr Glu Ala Gly Ser Met Phe Phe Thr
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      Leu Phe Ala Tyr Leu Met Cys Leu Tyr Gly Asn His Lys Thr Ser Ala
 45                   165                 170                 175

      Phe Leu Gly Phe Cys Gly Phe Met Phe Arg Gln Thr Asn Ile Ile Trp
                  180                 185                 190

 50   Ala Val Phe Cys Ala Gly Asn Val Ile Ala Gln Lys Leu Thr Glu Ala
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      Trp Lys Thr Glu Leu Gln Lys Lys Glu Asp Arg Leu Pro Pro Ile Lys
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      Gly Pro Phe Ala Glu Phe Arg Lys Ile Leu Gln Phe Leu Leu Ala Tyr
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                  260             265             270

      Gly Ile Val Ile Gly Asp Arg Ser Ser His Glu Ala Cys Leu His Phe
                  275             280             285
 10
      Pro Gln Leu Phe Tyr Phe Phe Ser Phe Thr Leu Phe Phe Ser Phe Pro
                  290             295             300

      His Leu Leu Ser Pro Ser Lys Ile Lys Thr Phe Leu Ser Leu Val Trp
 15   305             310             315             320

      Lys His Gly Ile Leu Phe Leu Val Val Thr Leu Val Ser Val Phe Leu
                  325             330             335

 20   Val Trp Lys Phe Thr Tyr Ala His Lys Tyr Leu Leu Ala Asp Asn Arg
                  340             345             350

      His Tyr Thr Phe Tyr Val Trp Lys Arg Val Phe Gln Arg Tyr Ala Ile
                  355             360             365
 25
      Leu Lys Tyr Leu Leu Val Pro Ala Tyr Ile Phe Ala Gly Trp Ser Ile
          370             375             380

      Ala Asp Ser Leu Lys Ser Lys Pro Ile Phe Trp Asn Leu Met Phe Phe
 30   385             390             395             400

      Ile Cys Leu Phe Ile Val Ile Val Pro Gln Lys Leu Leu Glu Phe Arg
                  405             410             415

 35   Tyr Phe Ile Leu Pro Tyr Val Ile Tyr Arg Leu Asn Ile Thr Leu Pro
                  420             425             430

      Pro Thr Ser Arg Leu Val Cys Glu Leu Ser Cys Tyr Ala Ile Val Asn
          435             440             445
 40
      Phe Ile Thr Phe Tyr Ile Phe Leu Asn Lys Thr Phe Gln Trp Pro Asn
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          Cys Glu Leu Cys Gly Tyr Ser Arg Ala Glu Val Met Gln Arg Pro Cys
                50                  55                  60

10        Thr Cys Asp Phe Leu His Gly Pro Arg Thr Gln Arg Arg Ala Ala Ala
          65                  70                  75                  80

          Gln Ile Ala Gln Ala Leu Leu Gly Ala Glu Glu Arg Lys Val Glu Ile
                          85                  90                  95
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          Ala Phe Tyr Arg Lys Asp Gly Ser Cys Phe Leu Cys Leu Val Asp Val
                      100                 105                 110

          Val Pro Val Lys Asn Glu Asp Gly Ala Val Ile Met Phe Ile Leu Asn
20                    115                 120                 125

          Phe Glu Val Val Met Glu Lys Asp Met Val Gly Ser Pro Ala His Asp
                130                 135                 140

25        Thr Asn His Arg Gly Pro Pro Thr Ser Trp Leu Ala Pro Gly Arg Ala
          145                 150                 155                 160

          Lys Thr Phe Arg Leu Lys Leu Pro Ala Leu Leu Ala Leu Thr Ala Arg
                          165                 170                 175

30        Glu Ser Ser Val Arg Ser Gly Gly Ala Gly Gly Ala Gly Ala Pro Gly
                      180                 185                 190

          Ala Val Val Val Asp Val Asp Leu Thr Pro Ala Ala Pro Ser Ser Glu
35                    195                 200                 205

          Ser Leu Ala Leu Asp Glu Val Thr Ala Met Asp Asn His Val Ala Gly
                210                 215                 220

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          225                 230                 235                 240

          Pro Arg Ser Ala Pro Gly Gln Leu Pro Ser Pro Arg Ala His Ser Leu
                          245                 250                 255
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          Asn Pro Asp Ala Ser Gly Ser Ser Cys Ser Leu Ala Arg Thr Arg Ser
                      260                 265                 270

          Arg Glu Ser Cys Ala Ser Val Arg Arg Ala Ser Ser Ala Asp Asp Ile
50              275                 280                 285

          Glu Ala Met Arg Ala Gly Val Leu Pro Pro Pro Arg His Ala Ser
                290                 295                 300

55        Thr Gly Ala Met His Pro Leu Arg Ser Gly Leu Leu Asn Ser Thr Ser
          305                 310                 315                 320
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        Asp Ser Asp Leu Val Arg Tyr Arg Thr Ile Ser Lys Ile Pro Gln Ile
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    5   Thr Leu Asn Phe Val Asp Leu Lys Gly Asp Pro Phe Leu Ala Ser Pro
                    340             345             350

        Thr Ser Asp Arg Glu Ile Ile Ala Pro Lys Ile Lys Glu Arg Thr His
                355             360             365

   10   Asn Val Thr Glu Lys Val Thr Gln Val Leu Ser Leu Gly Ala Asp Val
                370             375             380

        Leu Pro Glu Tyr Lys Leu Gln Ala Pro Arg Ile His Arg Trp Thr Ile
        385             390             395             400

   15   Leu His Tyr Ser Pro Phe Lys Ala Val Trp Asp Trp Leu Ile Leu Leu
                        405             410             415

        Leu Val Ile Tyr Thr Ala Val Phe Thr Pro Tyr Ser Ala Ala Phe Leu
   20                   420             425             430

        Leu Lys Glu Thr Glu Glu Gly Pro Pro Ala Thr Glu Cys Gly Tyr Ala
                435             440             445

   25   Cys Gln Pro Leu Ala Val Val Asp Leu Ile Val Asp Ile Met Phe Ile
                450             455             460

        Val Asp Ile Leu Ile Asn Phe Arg Thr Thr Tyr Val Asn Ala Asn Glu
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                        485             490             495

   35   Trp Phe Leu Ile Asp Met Val Ala Ala Ile Pro Phe Asp Leu Leu Ile
                    500             505             510

        Phe Gly Ser Gly Ser Glu Glu Leu Ile Gly Leu Leu Lys Thr Ala Arg
                515             520             525

   40   Leu Leu Arg Leu Val Arg Val Ala Arg Lys Leu Asp Arg Tyr Ser Glu
                530             535             540

        Tyr Gly Ala Ala Val Leu Phe Leu Leu Met Cys Thr Phe Ala Leu Ile
        545             550             555             560

   45   Ala His Trp Leu Ala Cys Ile Trp Tyr Ala Ile Gly Asn Met Glu Gln
                        565             570             575

   50   Pro His Met Asp Ser Arg Ile Gly Trp Leu His Asn Leu Gly Asp Gln
                    580             585             590

        Ile Gly Lys Pro Tyr Asn Ser Ser Gly Leu Gly Gly Pro Ser Ile Lys
                595             600             605

   55   Asp Lys Tyr Val Thr Ala Leu Tyr Phe Thr Phe Ser Ser Leu Thr Ser
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                      645             650             655

      Gly Asn Val Ser Ala Ile Ile Gln Arg Leu Tyr Ser Gly Thr Ala Arg
                  660             665             670

 10   Tyr His Thr Gln Met Leu Arg Val Arg Glu Phe Ile Arg Phe His Gln
              675             680             685

      Ile Pro Asn Pro Leu Arg Gln Arg Leu Glu Glu Tyr Phe Gln His Ala
          690             695             700
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      Trp Ser Tyr Thr Asn Gly Ile Asp Met Asn Ala Val Leu Lys Gly Phe
      705             710             715             720

      Pro Glu Cys Leu Gln Ala Asp Ile Cys Leu His Leu Asn Arg Ser Leu
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      Leu Gln His Cys Lys Pro Phe Arg Gly Ala Thr Lys Gly Cys Leu Arg
                  740             745             750

 25   Ala Leu Ala Met Lys Phe Lys Thr Thr His Ala Pro Pro Gly Asp Thr
                  755             760             765

      Leu Val His Ala Gly Asp Leu Leu Thr Ala Leu Tyr Phe Ile Ser Arg
          770             775             780
 30
      Gly Ser Ile Glu Ile Leu Arg Gly Asp Val Val Val Ala Ile Leu Gly
      785             790             795             800

 35   Lys Asn Asp Ile Phe Gly Glu Pro Leu Asn Leu Tyr Ala Arg Pro Gly
                  805             810             815

      Lys Ser Asn Gly Asp Val Arg Ala Leu Thr Tyr Cys Asp Leu His Lys
                  820             825             830

 40   Ile His Arg Asp Asp Leu Leu Glu Val Leu Asp Met Tyr Pro Glu Phe
              835             840             845

      Ser Asp His Phe Trp Ser Ser Leu Glu Ile Thr Phe Asn Leu Arg Asp
          850             855             860
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      Thr Asn Met Ile Pro Gly Ser Pro Gly Ser Thr Glu Leu Glu Gly Gly
      865             870             875             880

      Phe Ser Arg Gln Arg Lys Arg Lys Leu Ser Phe Arg Arg Arg Thr Asp
 50               885             890             895

      Lys Asp Thr Glu Gln Pro Gly Glu Val Ser Ala Leu Gly Pro Gly Arg
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 55   Ala Gly Ala Gly Pro Ser Ser Arg Gly Arg Pro Gly Gly Pro Trp Gly
              915             920             925
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Glu Ser Pro Ser Ser Gly Pro Ser Ser Pro Glu Ser Ser Glu Asp Glu
    930   935   940

Gly Pro Gly Arg Ser Ser Ser Pro Leu Arg Leu Val Pro Phe Ser Ser
945   950   955   960

Pro Arg Pro Pro Gly Glu Pro Pro Gly Gly Glu Pro Leu Met Glu Asp
                965   970   975

Cys Glu Lys Ser Ser Asp Thr Cys Asn Pro Leu Ser Gly Ala Phe Ser
            980   985   990

Gly Val Ser Asn Ile Phe Ser Phe Trp Gly Asp Ser Arg Gly Arg Gln
        995   1000   1005

Tyr Gln Glu Leu Pro Arg Cys Pro Ala Pro Thr Pro Ser Leu Leu
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Asn Ile Pro Leu Ser Ser Pro Gly Arg Arg Pro Arg Gly Asp Val
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Glu Ser Arg Leu Asp Ala Leu Gln Arg Gln Leu Asn Arg Leu Glu
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Thr Arg Leu Ser Ala Asp Met Ala Thr Val Leu Gln Leu Leu Gln
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Arg Gln Met Thr Leu Val Pro Pro Ala Tyr Ser Ala Val Thr Thr
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Pro Gly Pro Gly Pro Thr Ser Thr Ser Pro Leu Leu Pro Val Ser
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Pro Leu Pro Thr Leu Thr Leu Asp Ser Leu Ser Gln Val Ser Gln
    1100   1105   1110

Phe Met Ala Cys Glu Glu Leu Pro Pro Gly Ala Pro Glu Leu Pro
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Gln Glu Gly Pro Thr Arg Arg Leu Ser Leu Pro Gly Gln Leu Gly
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Asp Val Phe Arg Arg Ile Phe Ile Thr Tyr Met Asp Asn Trp Arg Gln
        15                  20                  25

aac aca aca gct gag caa gag gcc ctc caa gcc aaa gtt gat gct gag         205
Asn Thr Thr Ala Glu Gln Glu Ala Leu Gln Ala Lys Val Asp Ala Glu
        30                  35                  40

aac ttc tac tat gtc atc ctg tac ctc atg gtg atg att gga atg ttc         253
Asn Phe Tyr Tyr Val Ile Leu Tyr Leu Met Val Met Ile Gly Met Phe
45                  50                  55                  60

tct ttc atc atc gtg gcc atc ctg gtg agc act gtg aaa tcc aag aga         301
Ser Phe Ile Ile Val Ala Ile Leu Val Ser Thr Val Lys Ser Lys Arg
                65                  70                  75

cgg gaa cac tcc aat gac ccc tac cac cag tac att gta gag gac tgg         349
Arg Glu His Ser Asn Asp Pro Tyr His Gln Tyr Ile Val Glu Asp Trp
            80                  85                  90

cag gaa aag tac aag agc caa atc ttg aat cta gaa gaa tcg aag gcc         397
Gln Glu Lys Tyr Lys Ser Gln Ile Leu Asn Leu Glu Glu Ser Lys Ala
            95                  100                 105

acc atc cat gag aac att ggt gcg gct ggg ttc aaa atg tcc ccc tga         445
Thr Ile His Glu Asn Ile Gly Ala Ala Gly Phe Lys Met Ser Pro
            110                 115                 120

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Val Ile Leu Tyr Leu Met Val Met Ile Gly Met Phe Ser Phe Ile Ile
        50                  55                  60

Val Ala Ile Leu Val Ser Thr Val Lys Ser Lys Arg Arg Glu His Ser
65                  70                  75                      80

Asn Asp Pro Tyr His Gln Tyr Ile Val Glu Asp Trp Gln Glu Lys Tyr
                85                  90                  95

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